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ABSTRACT

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A component transfer apparatus is provided. The component transfer apparatus comprises a pick and place machine having a component feed source and a movable pick head having access to the component feed source. A component alignment detector is directed toward the component feed source and a controller is coupled to the component alignment detector. The controller contains instructions which, when executed by the controller, cause the controller to compare the detected component alignment with a known component alignment.--

In the Claims:

Please withdraw claims 1-29 and 38-43.

All of the claims now pending in the application are reproduced below for the Examiner's convenience, whether they have been amended or not. Please amend the claims as indicated hereinbelow.

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30. (Amended) [An] A component transfer apparatus, [for moving components] comprising:

a pick and place machine including a controller connected to a movable pick head and a component feed source, said pick head having access to said component feed source; and[,]

a component alignment detector comprising a receiver directed toward said feed source [to detect an alignment of a component, said controller being] and connected to said controller, wherein said controller contains instructions which, when (executed) by said controller, cause said controller [receiver and configured] to compare [the] a detected component alignment with a known component alignment.

31. The apparatus of claim 30, wherein said component feed source comprises a continuous serial track component feed source.

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32. The apparatus of claim 31, wherein said continuous serial track component feed source further comprises a plurality of component trays serially disposed along said track.

x 33. The apparatus of claim 32, wherein said plurality of component trays contains a recess having an asymmetric shape.

34. The apparatus of claim 30, wherein said feed source further comprises a plurality of serial feed sources.

y 35. (Amended) The apparatus of claim 34, wherein said detector further comprises a plurality of receivers and each of said plurality of serial feed sources has at least one corresponding receiver directed toward said feed source [positioned to detect an alignment of a component in said serial feed source].

36. The apparatus of claim 30, wherein said detector and said pick head are distinct members.

37. The apparatus of claim 30, wherein said detector is stationary with respect to said pick head.

Please add the following claims:

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44. A component transfer apparatus, comprising:
a pick and place machine having a component feed source and a movable pick head having access to said component feed source;
a component alignment detector directed toward said component feed source; and
a controller coupled to said component alignment detector and containing instructions which, when executed by said controller, cause said controller to compare a detected component alignment with a predetermined component alignment.

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45. The component transfer apparatus of claim 44, wherein said component alignment detector is focused on at least one asymmetric recess defined in said component feed source.

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46. The component transfer apparatus of claim 44, wherein said component alignment detector is a camera.

47. The component transfer apparatus of claim 44, wherein, when executed, said controller instructions furthermore cause said controller to align a component.

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48. The component transfer apparatus of claim 44, wherein said controller contains instructions which, when executed, cause said controller to affect a control scheme in response to said component alignment comparison.

49. The component transfer apparatus of claim 44, wherein said component feed source includes a continuous track of trays.

50. The component transfer apparatus of claim 44, wherein said component feed source includes a plurality of serial feed tracks.

51. The component transfer apparatus of claim 44, wherein said component feed source includes a continuous tape reel.

52. The component transfer apparatus of claim 44, wherein, when executed, said controller instructions furthermore cause said controller to prevent movement of said component feed source.

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53. The component transfer apparatus of claim 44, wherein the component includes leads having an alignment and a fiducial marker having an alignment that corresponds to said lead alignment.

54. The component transfer apparatus of claim 44, wherein the component includes leads having an alignment and at least two fiducial markers each having an alignment that corresponds to said lead alignment.

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55. A component transfer apparatus, comprising:
a pick and place machine having a component feed source and a movable pick head having access to said component feed source;
a component alignment detector directed toward said component feed source; and
a controller coupled to said component alignment detector and containing instructions which, when executed by said controller, cause said controller to compare a detected alignment of a fiducial marker of a component positioned adjacent said component feed source with a predetermined component alignment.

56. The component transfer apparatus of claim 55, wherein said detector contains instructions which, when executed by said detector, cause said detector to detect an orientation of said fiducial marker.

57. The component transfer apparatus of claim 55, wherein said fiducial marker includes a shape of the component.

58. The component transfer apparatus of claim 55, wherein said fiducial marker includes a structural portion of the component.

59. The component transfer apparatus of claim 55, wherein said fiducial marker includes a superficial mark on the component.

60. The component transfer apparatus of claim 59, wherein said mark is selected from the group consisting of a geometric shape and a character.

61. A component transfer apparatus, comprising:
a pick and place machine having a component feed source and a movable pick head having access to said component feed source;
a component alignment detector directed toward said component feed source and having an alignment signal output; and
a controller coupled to said component alignment detector alignment signal output and containing instructions which, when executed by said controller, cause said

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controller to compare a detected component alignment with a known component alignment.

62. The component transfer apparatus of claim 61, wherein said alignment signal prompts an operator.

63. The component transfer apparatus of claim 61, wherein said controller is coupled to said pick and place machine.

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64. A component transfer apparatus, comprising:
a pick and place machine having a component feed source and a movable pick head having access to said component feed source;
a component alignment detector directed toward said component feed source; and
a controller coupled to said component alignment detector and containing instructions which, when executed by said controller, cause said controller to compare a detected component alignment with a known component alignment, and cause said movable pick head to pick a component from said component feed source.

65. The component transfer apparatus of claim 64, wherein said controller furthermore contains instructions which, when executed, provide a component position offset.

66. The component transfer apparatus of claim 65, wherein said controller further contains instructions which, when executed, cause said movable pick head to align the component.

67. The component transfer apparatus of claim 64, further comprising a component mounting station having access to said moveable pick head, wherein said controller further contains instructions which, when executed, cause said controller to place the component on a substrate in said component mounting station.

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68. The component transfer apparatus of claim 64, wherein said controller further contains instructions which, when executed, cause said controller to place a component in a discard area.

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69. A component transfer apparatus, comprising:
a pick and place machine having a component feed source, a component mounting station and a moveable pick head, wherein said moveable pick head has access to said component feed source and said component mounting station;
(a camera) directed toward said component feed source; and
a controller coupled to said camera and containing instructions which, when executed by said controller, cause said controller to compare an alignment of the component detected by said camera with a known alignment.

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70. A component transfer apparatus, comprising:
a pick and place machine having a component feed source and a moveable pick head, wherein said component feed source includes at least one nest that defines an asymmetric recess and said moveable pick head has access to said component feed source; and
a component alignment detector directed toward said feed source.

71. The component transfer apparatus of claim 70, further comprising a controller containing instructions which, when executed by said controller, cause said controller to compare the detected component alignment with a known component alignment.

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72. The component transfer apparatus of claim 71, wherein, when executed, said controller instructions cause said controller to advance said component feed source.

73. A component transfer apparatus, comprising:
component conveying means having an asymmetric recess;
means for detecting the alignment of the component in the asymmetric recess; and